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Non-Vital Bleaching

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Introduction

Many materials and techniques improve the shade of discolored nonvital teeth. It is impossible to guarantee an optimal result and even when an acceptable color is obtained, the tooth may darken over time (1,2). Placing a mixture of sodium perborate and water within the pulp chamber was initially proposed in 1961 by Spasser (3). Nutting and Poe described a "walking-bleach" mixture of sodium perborate and 30% hydrogen peroxide (4). Heating hydrogen peroxide was discontinued following evidence that combining heat and hydrogen peroxide led to cervical resorption (5).

Etiology

It is important to differentiate between extrinsic and intrinsic tooth stain for a positive outcome. Each contributes to discoloration. Internal bleaching is appropriate for dentin staining from pulpal hemorrhage, necrosis or obturation materials. Discoloration commonly results from trauma. Breakdown products from erythrocytes of ruptured vessels penetrate dentinal tubules causing stains. Enamel stain is treated externally with polishing or with an application of in-office or at-home bleaching agents (6).

Hydrogen Peroxide

Different concentrations of hydrogen peroxide are available. One option is aqueous hydrogen peroxide available in syringe form for the "walking bleach" technique. Aqueous solutions of 30% or 35% hydrogen peroxide or 37% carbamide peroxide are effective methods for intracoronally bleaching non-vital teeth (6, 7). There are known cytotoxic effects of hydrogen peroxide on PDL cells (8), so it is important to protect the gingival tissue with a petroleum jelly based or similar product. Excellent clinical results with minimal hydrogen peroxide diffusion is ideal. It has been shown that more hydrogen peroxide diffuses to the root surface with 35% hydrogen peroxide versus 35% carbamide peroxide or sodium perborate and water (9).

Sodium Perborate

Sodium perborate has been mixed with water, hydrogen peroxide, chlorhexidine, and natrosol-a gel vehicle. Liquid vehicles produce significant bleaching seven days faster than gels. All vehicles have eventually resulted in successful intracoronal bleaching with sodium perborate (6). Several types of sodium perborate exist and tetrahydrate sodium perborate mixed with water results in less hydrogen peroxide reaching the PDL (10). A ratio of 2:1 (g/mL) is recommended for sodium perborate (tetrahydrate) and distilled water (10). Sodium perborate breaks down into sodium metaborate and hydrogen peroxide releasing nascent oxygen (6,11). An alternative to mixing sodium perborate with water is mixing it with physiologic saline (12). There is no published data reporting the efficacy of bleaching agents mixed with anesthetic solution, therefore it is not recommended. Scanning electron microscopy and colorimetry proves sodium perborate with water is effective and does not lead to ultrastructural changes in dentin (12).

Technique

Most non-vital techniques describe sealing a bleaching agent intracoronally, then evaluating color change. Prior to internal bleaching, root structure, obturation material and cervical tissue should be protected with an intracoronal barrier. Glass-ionomer or a resin modified glass-ionomer can be used as the barrier. Since bleaching agents diffuse to the external tooth surface (9) and they are cytotoxic to the PDL (8), it is recommended to place an intracoronal barrier 1mm incisal to the epithelial attachment (13). The shape of the barrier has been described from the facial as a "bobsled tunnel" and from the proximal as a "ski slope" (13). These shapes are formed as the barrier follows the contour of the epithelial attachment. If the barrier is level with the facial height of attachment, proximal epithelial attachment may be exposed to the cytotoxic bleaching material. Limiting exposure of the attachment apparatus and cemental defects to bleaching agents is important in preventing cervical resorption (14). A barrier thickness of 2mm is sufficient. As this thickness is reduced to 1.0 mm-0.5mm, an increase in hydrogen peroxide penetration is observed (15). If the position of the intraorifice barrier compromises the cervical esthetics, small layers of the barrier can gradually be removed and a milder bleaching material used (15). Mineral trioxide aggregate (MTA) is not recommeded as an intracoronal barrier. Direct contact of MTA with hydrogen peroxide concentrations as low as 3.5% (pH 6.13) causes deterioration of the material and suggests that it serves as an inadequate barrier. If MTA is used, it should be shielded with a resin or glass ionomer (16).

Based on the time-course diffusion of hydrogen peroxide, in patients 40-60 years old, a 20% peroxide carbamide gel should be replaced in 18 hours (17). In patients younger than 20 years old, the bleaching gel can be left for 33 hours, or about 2 days, before replacing it (17). These times are not absolute, but there is a limited benefit to prolonging time between appointments.

Combined Techniques

Multiple treatments with hydrated sodium perborate may not produce satisfactory results for a patient with a severely discolored endodontically treated tooth. The success of internal bleaching is directly related to its ability to penetrate into the dentinal tubules and reach the enamel (18). If the results are not satisfactory after 3-4 visits, external bleaching may supplement the walking bleach technique (6). Walking bleach supplemented with chairside power bleaching at the first visit can result in faster whitening of severely discolored endodontically treated teeth in fewer visits. After isolation with rubber dam, the tooth may be bleached intra and extracoronally with 38% carbamide peroxide for 15 minutes then thoroughly rinsed. The procedure is

repeated for an additional 15 minutes followed by the intracoronal application of hydrated sodium perborate. At the conclusion of the procedure, a sufficient provisional restoration is placed to seal the endodontic access. The patient should be appointed in 5-7 days for evaluation. If acceptable results are obtained, follow the recommended restorative protocol for the final restoration.

Restoration

Temporization of the endodontic access for one week allows the least amount of leakage with a hydraulic filling material (19). Immediate restoration after treatment is contraindicated due to the impaired ability to bond to dentin. Treatment with 10% sodium ascorbate or delaying the definitive restoration by one week will improve the seal (20).

Complications

Cervical resorption by odontoclastic action is not well understood. Resorption is asymptomatic unless it perforates to the pulp. It is detectable early radiographically but often misdiagnosed or overlooked. Intra-coronal bleaching may be associated with cervical resorption (21). If intracoronal bleaching is performed, follow-up exams should be recommended since several years may pass before cervical resorption appears (6). It is treatable if identified early (14,21). For more information on cervical resorption, please refer to a previous Naval Postgraduate Dental School Clinical Update on cervical resorption (22).

Conclusion

Intracoronal bleaching of non-vital teeth provides a service that may prevent more invasive esthetic procedures (6). Understanding materials and techniques helps clinicians provide their patients with effective treatment options.

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